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MARKSMANSHIP.

By R. L. SACKETT,
President of the Society.

After the student has been selected or has been accepted without much more than natural selection then the results will depend, not on the curriculum, not on the elaborate apparatus, not on expensive buildings, but on the quality of the teacher. We all know his importance, but nevertheless, he does not receive his share of attention.

In the first place, we lack proper measures of his skill. It is easier to measure laboratories, buildings, stadiums. But still every campus has men who are generally recognized as good teachers. There are measures of teaching skill. Do we apply them and do we reward the able?

The Society should lend its support to giving proper recognition to the teacher who loves to teach and teaches for that reason. We are not discussing research but teaching, and the ripe, rich, spiritual teacher is more precious than rubies.

Teaching has been commercialized to some extent. Even low salaries attract some who desire to teach for one reason or another but who have no special fitness.

Sometimes traditions close the doors to the advancement of young, promising instructors.

Are administrators, heads of departments and older teachers giving due weight to superior *teachers*, whether old or young and encouraging them by appropriate means to greater effort and higher achievement.

The summer courses at Cornell and Wisconsin Universities were a marked success. The Society should expand its program of internal improvement. Other subjects need the same kind of a revival.

The institutions can also wield an influence by considering the teacher, his needs and his improvement. Is each one giving this important subject the attention it needs?

The student and the teacher! What else matters in comparison? Is the good teacher getting due consideration?

OBITUARY.

PERLEY F. WALKER.

Dean Perley F. Walker of the School of Engineering and Architecture at the University of Kansas committed suicide by shooting during the night of October 16, 1927. There appears to be no possible cause for the act other than a complete mental breakdown. His behavior seemed normal up to the evening of the sixteenth, when he left his home for the office stating that he had some work to do. He was always a busy man, but his duties were not particularly strenuous for him at this time. The affairs of the Engineering School were never in better condition.

Dean Walker was born in Emden, Maine, April 28, 1875. He was graduated from the University of Maine, Mechanical Engineering course, in 1896 and took his degree of Master of Mechanical Engineering at Cornell in 1900. He was instructor in Mechanical Engineering at the University of Maine following his graduation there and until he attended Cornell University. From Cornell he went to the Newport News Ship Building Company at Newport News, Virginia, where he remained until 1902. In 1902 he was asked to return to the University of Maine as professor of Mechanical Engineering. He filled this position, also acting as Commandant of the military department, until 1905, when he accepted the position of head of the Mechanical Engineering department of the University of Kansas. On the death of Dean Marvin in 1913 he was made Dean of the Engineering School, and at the same time his teaching title was changed to professor of Industrial Engineering, as he was primarily interested in this branch of engineering work.

Immediately upon the declaration of war in 1917 Dean Walker entered the Officers' Training School at Fort Riley. He became a major in the 314th Engineers in August of that year, and was colonel of the 314th Engineers Reserve at the

time of his death. At the close of the war he had risen to the position of colonel in the 219th regiment. All of his time during the war period was spent in the training of officers and troops. He was disappointed that he did not see service in France.

Dean Walker was a member of the American Society of Mechanical Engineers, the Society of Military Engineers, the American Management Association, of the honorary societies of Tau Beta Pi and Sigma Xi, as well as a host of other organizations. As a very active member of the Society for the Promotion of Engineering Education he served as its president for the year 1923–24, during which year much of the organization work relative to the investigation of engineering education now in progress was accomplished. He is the author of "Management Engineering," a college text-book and reference volume. He was a member of the American Engineering Council and did much of the field work covered in their report on the purchase, delivery, and storage of coal. He personally prepared much of this report. He was a regular contributor to the technical papers.

As a citizen of the State of Kansas he devoted his energies to the promotion of industries within the state. His industrial surveys were numerous and were prepared with extreme care. He was looked upon as a high authority in industrial matters. As a citizen of Lawrence he was extremely active in all matters pertaining to the good of the community.

Dean Walker is survived by Mrs. Walker, his father, and two brothers. There are no living children.

Lawrence, the University of Kansas, and the State of Kansas will miss him and Engineering Education nationally mourns his loss.

A SUGGESTED METHOD OF PRESENTING NEWTON'S SECOND LAW OF MOTION.

By NEIL P. BAILEY,

Assistant Professor of Mechanical Engineering, University of Idaho.

The failure to grasp completely Newton's Second Law of Motion is one of the worst stumbling blocks of the average undergraduate student in Dynamics. Past observation has convinced the writer that this trouble is primarily caused by the introduction of the thoroughly intangible quantity, mass, as the fundamental unit in the statement of the familiar law, $F = Ma$.

It is far easier for the student, or any one else, to think in terms of a tangible thing which our physical sense can experience, such as force, than to attempt to deal in such an elusive thing as "the quantity of matter in a body." The quantities of force, distance, and time can be measured directly, but the quantity mass is distinctly a derived thing.

All human experience has taught that for a given body, the greater the force exerted upon it, the greater is the tendency to change its velocity or to accelerate it. This may be stated as,

$$F \propto a$$

or

$$F = Ka$$

This last may be then taken as a universal law of motion applying to any point on the earth's surface, and it remains only to evaluate the constant (K). This may be done by finding the value of (F) experimentally for any value of (a), and solving for (K). Direct measurement on falling bodies gives the value of (a) in the earth's gravitational field at any point as (g), which varies slightly, but has an average value of 32.2 feet per sec. per sec. Also, when a body is supported in the earth's field, an upward force equal to the accelerating

force of gravity must be exerted. This may be measured directly, and is the weight of the body (W).

This gives values of (a) and (F) for the general equation, yielding the value of $K = W/g$ which gives the equation,

$F = W/g\,a$ for any point on the earth's surface.

In this way, the entire discussion uses quantities which lie in the realm of human experience, and is consequently far less confusing to the student than one which uses the derived quantity mass as its basis.

WORLD CONGRESS OF ENGINEERS, TOKYO, JAPAN, IN 1929.

Representatives of more than twenty-five national engineering societies met at a dinner on Friday, October 7, at the University Club in New York, to do honor to Baron C. Shiba, of Japan, and to learn of the plans for the World Congress of Engineers to be held in Tokyo in October, 1929. Mr. Elmer A. Sperry, the host of the evening, recounted in his gracious speech of welcome his personal experiences and observations in Japan and expressed high admiration for the unprecedented engineering progress of the Japanese people. Under the toastmastership of Mr. John W. Lieb, widely known as an engineering internationalist, representatives of the national engineering societies extended greetings to the guest of honor and assured him of the support of their colleagues in the proposed Congress. Resolutions endorsing the Congress and pledging hearty support were unanimously adopted by those present.

The active sponsor of the Congress is the Kôgakkai or Engineering Society of Japan and the project has the official support and aid of the Imperial Government. The matters to be considered are grouped under seventeen general heads which cover the entire range of engineering science, technology and functions. It is of interest to note that the first item of the first major division which deals with "general problems concerning engineering" is education. Baron Shiba assured the writer that this matter is now considered to be of particular importance in Japan and will have a prominent place in the deliberations of the Congress.

Baron Shiba is a striking example of the distinction to which engineering educators may attain in other lands. He is professor of marine engineering and aeronautics in the Imperial University of Tokyo, Director of the Aeronautic Research Institute, Chairman of the Board of Directors of

the Imperial Japanese Marine Corporation, and a Member of the House of Peers. He created great public interest in New York by exhibiting motion pictures taken with special apparatus of his own invention which is capable of operating up to 20,000 exposures per second.

The Society was represented at the dinner by Past-President Pegram and Director Wickenden.

CONFERENCE ON DRAWING.

The second annual conference of drawing teachers was called to order by Professor Thomas E. French of Ohio State University, Chairman of Committee No. 19, Drawing and Design, at 9:30 A.M., June 29, 1927, in Wingate Hall at the University of Maine. The following members were present: G. C. Anthony, W. E. Farnham, Tufts College; E. F. Fozer, Northeastern University; T. E. French, Ohio State University; G. B. Gee, Northeastern University; H. E. Genz, Georgia School of Technology; S. G. Hall, R. P. Hoelscher, H. H. Jordan, University of Illinois; B. C. Kent, University of Maine; F. Kerekes, Iowa State College; J. R. Lapham, George Washington University; E. F. Lawrence, A. W. Leighton, Tufts College; H. M. McCully, Carnegie Institute of Technology; E. MacNaughton, P. A. Mars, Tufts College; E. Robinson, University of Vermont; E. B. Rollins, Tufts College; C. A. Sherer, University of Maine; F. M. Simpson, Bucknell University; W. G. Smith, Northwestern University; T. A. Sparrow, University of Maine; R. K. Steward, Michigan State College; C. L. Walker, Cornell University; M. Wenk, Oregon State College; C. P. Weston, University of Maine.

With the consent of those present Professor French appointed Professor R. P. Hoelscher of the University of Illinois to act as secretary.

The first topic presented for discussion was "The Segregation of Students in Drawing Courses According to Ability." Professor H. W. Miller of the University of Michigan had been asked to open the discussion, but being unable to be present, he sent a written discussion which was read by Professor French as follows:

Some five years ago, when we were at work reorganizing courses in the Department of Drawing in accordance with new arrangements permitted us by the faculty of the College of Engineering, it occurred to us that we might make some attempt during the ensuing years to learn

if we could accomplish anything by segregating the high, low, and average pupils in our various drawing classes. After some study of the problem it seemed to us that we could learn more about segregation itself by experimenting in classes of students in Descriptive Geometry than through the medium of any other subject. There is no point to my explaining why, because the reason is obvious.

We began our experiments in segregating students in Descriptive Geometry during the second semester of the school year 1922–1923, but we soon found that we had no adequate conception of the problems involved, and our experiment was only a half-hearted and very unsatisfactory one from the standpoint of securing any worth-while knowledge. We really found out on that occasion that we did not know anything about segregation. Perhaps that is what one learns usually in his first trial of any experiment, and that trial may have served a good purpose; in fact, it did, for it showed us that we would have to plan for the next experiment very carefully.

As a consequence of our first experiment we began our plans during the first semester of the following year for the experiment that would be conducted on our large group of Descriptive Geometry students during the second semester. We decided, just arbitrarily, that we would place in the high sections all students whose general average on all work of the first semester was equal to 3 or more. In explanation of this I might say that we give the letter grade of "A" for averages between 90 and 100 per cent., "B" for 80 to 90 per cent., "C" for 70 to 80 per cent., and "D" for 60 to 70 per cent. In making up honor averages, then, a value of 4 is given to "A," 3 to "B," 2 to "C," and 1 to "D." Thus the students that we would put into the high sections had to average at least a grade of "B." We decided to place in the low sections all students whose grades averaged 1.5 or less. We were able to secure all the necessary grades in our Secretary's office during the examination weeks and had all of the necessary information for segregating the students before registration days. We classify our students in Drawing 2 (Descriptive Geometry) into five main groups according to the time of the week when they report for work. These groups average from 60 to 70 students. We made no attempt to control the classification in these groups for the purposes of our experiment, because we felt that we ought to work under normal conditions. As soon as the classification was completed we examined the various groups for the men with averages above 3 and below 1.5, and found then and since that about one fifth of the total number of the groups had an average of 3 or more, and about one fifth an average of 1.5 or less; that is, one fifth of our students seemed to be superior, according to that particular definition of superior, and one fifth inferior. These made sections of just about the right size because we have been attempting

to keep our sections at fifteen and not under any circumstances larger than twenty.

Perhaps I should proceed now to the briefest sort of summary of our results. I anticipated that our instructors would object to teaching the inferior men. During the course of our experiments we selected five of our most experienced instructors and gave to each one section of high students and one section of low. None of these men had ever taught superior or inferior pupils in classes by themselves, so they were to enjoy a new experience. To my own surprise, I must say that we found that the experience of teaching at least one class of inferior pupils did not prove distasteful. I had expected that the instructors would object vigorously, but it seems to me that just by virtue of the fact that they had a homogeneous group, the caliber of whose intelligence they could accurately gauge, and for which they could properly plan, made all the difference. I have thought on several occasions that the classes of brilliant pupils gave more trouble and caused more annoyance to their instructors than the classes of inferior students; this because of the difficulty in satisfying their natural curiosity, in keeping up to their pace, in providing them with sufficient work to keep them busy, and in answering all the troublesome questions that such boys can ask. This was only in the beginning, however; now an instructor regards it a real privilege to teach such a group.

An interesting discovery with reference to the inferior pupils was that they are not, as one might expect, stupid in appearance, stupid in speech, untidy or slovenly in any respect at all. They proved in general to be superficially ingenious and bright boys, but almost without exception devoid of that quality of tenaciousness of purpose which we know is so essential to the satisfactory completion of any tedious job. They reminded me very much of the strapping laborer who spits on his hands and with a great show of energy starts digging as though he were going to dig a hole through the earth, and very quickly he is found leaning on something for support! Beside him is the rather unobtrusive, ordinary looking fellow who makes no show of energy, no claim to superiority, but plugs away all day long.

We have come to the conclusion that something very much worthwhile is to be gained, particularly by the superior pupils, by being segregated on the basis of ability. Inferior and average pupils gain likewise. We have come to the conclusion that there is nothing in the oft-expressed idea that inferior pupils are inspired by having the privilege of working with superior pupils; we are convinced that they are depressed and repressed. When they are by themselves, the few that are slightly brighter than others have some little opportunity to shine; the instructor gauges all of his work to their capacities, and they are more inclined to feel that they are accomplishing something than when they are mixed with average and superior students. We have

arrived at only a rough estimate of the extent of the gain, as well as the character of it. The full report that we prepared after the third experiment for our University Senate will be published in the near future in *School and Society*, so that all of the details of those experiments will be available for you shortly.

I would personally urge each of you to make some trial of segregation, first in the subject of Descriptive Geometry, where you can more easily learn how to proceed. I myself have taught sections of superior as well as sections of inferior students, and have been quite surprised at my own reactions to teaching the inferior students; I find that it is not unpleasant at all. I doubt if I should want more than one section at a time, and I believe that no instructor should be given more than one section at a time. We have come to the conclusion now that it is best to have each instructor teach superior and average or average and inferior sections. The contrast between the superior and inferior is too great, and one should give such extremes to only the better instructors in a course of experiments.

We have been trying experiments in segregating students in the elementary and advanced courses in drawing during the past two years and find it much more difficult to come to proper conclusions as to the character or the extent of the gain. Those courses are apt to be manual to such a large degree that I hardly dare presume to express any convictions as yet. There is no question but that it is worth while to segregate pupils in those subjects merely to have together men of the same caliber. There is a better spirit of good fellowship between men of the same general caliber than is possible between men of vastly different calibers. I think that counts and should be considered a gain. It is possible likewise for the instructor to begin brief discussions of the elementary problems of design with superior pupils while they are taking their more advanced drawing work; on the other hand, we have not found it possible to do this with any degree of satisfaction with the inferior groups. We have been segregating the students in elementary drawing on the basis of the amount of drawing that they have had before they enter college, and the students in advanced drawing on the basis of the quality of work that they have done in college in all subjects. I shall hope to present more to you later of this second phase of our experimentation.

Upon the completion of the reading of the paper Professor H. H. Jordan continued the discussion, basing his remarks upon somewhat similar experiments which had been conducted by the Drawing Department at the University of Illinois. The following paragraphs epitomize his discussion.

Two experiments were made at Illinois, with the course in descrip-

tive geometry as the medium for both. In the first experiment students were registered in the usual way and then later the poor students were segregated into sections by themselves. The selection was based upon the performance of the students in the descriptive geometry course itself. The average and bright students were left indiscriminately mingled in the other sections as registered. Older instructors were placed in charge of the poor sections and the work was again repeated from the beginning, thus giving them a thorough review. The work was then gradually speeded up and they were brought abreast of the regular sections toward the end of the course. They did not, of course, get the full treatment of certain parts of the work which the regular sections received. At the close of the semester it was felt by those in charge of the poor sections, that the students in these sections had profited by the segregation, although no statistical data to this effect could be shown. The instructors however, were not particularly enthusiastic about teaching the poor sections and there was some objection raised by a few students who disliked being reduced to the poor sections. No students were promoted out of the poor sections.

In the second experiment the students were segregated upon the basis of their scholastic standing during the previous semester in all courses. All students whose records would place them in the upper one sixth of the class were placed in sections by themselves and likewise those who were on probation (approximately the lowest one sixth of the class) were also placed in sections by themselves. This selection was made with sufficient accuracy by simply looking at the students record without obtaining the numerical average. The students were unaware of the segregation which was made at the regular registration time and objection on their part was thus avoided.

Four instructors handled these high and low sections, two of whom knew with what they had to deal and two of whom did not. The purpose of this was to get the reaction of the instructor without previous bias on his part. The men who were uninformed as to the project, however, very quickly recognized the type of students with which they had to deal and adjusted their teaching accordingly.

This experiment was felt to be very successful even though it did not reduce the number of failures in the department as a whole. It did however, enable the brighter men to achieve more than they otherwise would have been able to do. The method of segregation was found to be almost 100 per cent perfect, especially as regards the upper and lower groups, if judged by the final grades received by them. Some men in the middle group should have been put up or down at the end of first four or six weeks period. The percentage of failures in the middle group seemed high.

Professor Kerekes of Iowa State College called attention to the fact that the methods employed at Michigan and Illinois could not be utilized at smaller institutions where the total enrolment in drawing was too small to permit segregation into separate sections. He pointed out that the same end could be reached by a careful selection and assignment of problems according to the ability of the student. He stressed particularly the desirability of giving the high grade man problems which are a challenge to his ability.

The subject aroused a lively discussion which was further participated in by Professor Wm. Griswold Smith of Northwestern University and Professor E. Robinson of the University of Vermont.

Professor French then called upon Dean Gardner C. Anthony of Tufts College to address the conference. Dean Anthony spoke briefly, emphasizing the importance of informing the secondary schools of the requirements of the college in all subjects and particularly in Drawing, which he preferred to call "Graphics" as expressing more fully the ideal of language rather than that of penmanship, as implied by the very misleading term "Mechanical Drawing." Also that Graphics can be taught without the use of drawing instruments and should be taught as a means of expression, indeed the only universal one.

He also expressed the opinion that the omission of the term Descriptive Geometry would take some of the fearfulness away from the subject for students, and that it is superior to the study of Solid Geometry in secondary school as a means for training in conceptions of three dimensions.

As a word of encouragement to drawing teachers, he pointed out that the teaching of drawing offered an excellent opportunity for the teacher to exert a profound influence upon the future development of the student, and added that no study afforded such an opportunity for intimate analysis of the development of the mind of the student.

Professor Smith of Northwestern University was next called upon and in his remarks seconded the words of Dean

Anthony, especially as to the opportunity of the drawing teacher to render real service in the character development of the young engineer.

He congratulated the teachers of Drafting, or Graphics on the fact that their relations with Freshman were peculiarly intimate, and that thereby they were able to exert an especially strong influence on these boys at a particularly impressionable period in their student life.

Professor Farnham of Tufts College then outlined in detail the drawing course as it is given at that institution. The outstanding points of the presentation were; first, the segregation of drawing students upon the basis of their high school drawing work and the result of a three hour placement examination in drawing; second, the coordination of the work in drawing and descriptive geometry throughout the year; third, the focusing of the attention of the student upon one phase of the drawing work at a time, as for example, auxiliary views, sectioning, dimensioning, etc.; and finally the giving of test plates in the form of freehand sketches from models at intervals throughout the year. These test plates are done entirely upon the students own resources, collaboration between students being avoided by giving each one a different model. Each test was designed to summarize completely the work of the course up to the time of the test.

Professor Seavey commented briefly upon the cooperation between the English and Drawing departments at Tufts.

The time allotted to the meeting rapidly drawing to a close, in lieu of a prepared paper, Professor McCully of Carnegie Institute of Technology presented a brief summarized discussion of "The Place of the Drawing Department in the Engineering Curriculum," pointing out the advantages of the separate drawing department which enables the teacher to devote his entire time and attention to the subject of drawing instead of making it an incidental thing among the teaching of other subjects. It was also suggested that the breadth and scope of the work in drawing with the possibility of courses beyond the freshman year was not fully appreciated.

Mr. E. F. Lawrence of Tufts College in commenting upon Professor McCully's discussion suggested the possibilities of coordination of drawing with the courses given in later years where drawing is used as a working tool.

Before adjournment the conference enthusiastically supported the idea of continuing the conferences at future meetings of the Society.

DISCUSSION OF REPORT OF THE BOARD OF INVESTIGATION AND COORDINATION.* †

G. B. Pegram (Columbia): I did not realize that I was going to be called upon to open this discussion. Perhaps those in charge of the program thought that the man from Columbia might have some presentation of the problems that are here treated which would differ enough from that of the Board to start some really lively discussion. But I do not find myself in that position at all. We have had considerable experience at Columbia with a type of curriculum and with a method of administration which is different from that prevailing in most institutions. We have met some of the difficulties that are referred to in this report as resulting from such methods. We have had some of the satisfactions, not so fully referred to in the report, that result from such methods. But on the whole, I should say that our experience and our practice has been more in line with the conclusions of this report than is appreciated often by those who have only a superficial knowledge of our situation at Columbia.

In the first place, in the new undertakings that we started there, both in the direction of a longer course and in the administrative separation of the course into two parts, we never had any idea of having anything but a wholly unified course. We did try to see if by restricting our course to students who were prepared to spend a longer time on their education we could attain results with such a group that might justify in one institution at least the maintenance of such a course. As a matter of fact, we did three years ago move somewhat from that position because we then provided that a student could attain the B.S. degree in engineering in four years if he so

* Presented at the 35th Annual Meeting, University of Maine, June 27–30, 1927.

† Report published in Vol. XVIII, No. 1, JOURNAL OF ENGINEERING EDUCATION.

desires and make that the stopping point of his formal education.

But perhaps a point that might be of much interest to bring out has not to do with the length of the course, which is now practically a course leading to the B.S. degree with one more year leading to one of the specified engineering degrees, but has to do with the matter of administration of the course and the real unity which has been present at all times. To do that, I must speak not so much of an engineering school for a moment as of a type of undergraduate college which has been developed at Columbia and toward the development of which there are steps being taken in other institutions. We have in Columbia University, Columbia College, which is a general undergraduate institution for the whole university, for men. We have Barnard College for the women. No one can matriculate in Columbia University directly from the high school except through Columbia College, but Columbia College is not what is referred to as an "ordinary arts college." It is a special kind of institution. Seventy-five per cent of the students in Columbia College are definitely looking toward professional study or non-professional graduate work. They are professionally motivated.

We have in Columbia University been developing a collegiate organization in which all students in at least the first two years of their undergraduate life are students under a common administration in matters of discipline, athletics, and other extra curricular activities, rather than separated off in this or that separate professional school. So far as the program of study and the teaching itself is concerned, we have never departed from the idea of a unified program.

In our three year pre-engineering course, practically everything except the equivalent of one-half year of elective subjects is prescribed. In the two-year pre-engineering course, everything is prescribed and it is prescribed by the engineering faculty. The actual administration and the supervision of the students is under the undergraduate college for the first two years or the first three years for students who go on

and become candidates for the A.B. degree under the so-called professional option.

I do not think anyone at Columbia would want to say that this is a plan to be adopted in institutions generally. I have recently had communications from deans of engineering schools where the same or some similar arrangement was proposed. My own reply was to the effect that they should certainly beware of any such arrangement unless they were sure of the college, because if the first two years of engineering instruction is turned over to some arts colleges it will certainly fall to pieces.

But we can picture such an educational scheme as logical and we can all, I think, see certain advantages in it. The historical development of engineering education and collegiate education in this country is to be considered in this connection. Nothing is clearer than that the schools of engineering; the so-called scientific schools as some of them were at the beginning (notably the Lawrence Scientific School and the Sheffield Scientific School) came into existence in revolt against the then existing attitude of the ordinary colleges toward all scientific work. They would have little of it. Since that time, in the last fifty or sixty years, a great change has come about and we find our arts colleges freely admitting scientific subjects and studies so that in most colleges one can by suitable exercise of the privilege of election take a course leading to the ordinary college degree which would be as strictly scientific as anything he would meet in an engineering school.

On the other hand, the engineering schools, which at one time seemed to be veering away from general subjects and filling up their curriculums with scientific and technical subjects, have of late come back to the view that there is a certain minimum of general or humanistic studies which must be included in the education of every man, engineer or not. We see our two great undergraduate divisions of education have approached one another in the content of what is on the average thought to be a good curriculum for the undergraduate in at least the first part of his course before he begins to

specialize or develop special interest in this direction or that. The question does then arise as to whether in a university (this does not apply to the detached engineering school or to schools like our land grant colleges) there is going to continue to be the advantage in separating our youth as they come in from the high schools into two groups, one of whom we call engineers, and the other of whom we call arts students; or perhaps even into a larger number of groups. The question is a fair one whether or not, in the evolution of the undergraduate education which takes full account of the necessity for broad, general education of every student as a foundation for professional studies, we may not justly and with advantage at least in some of our larger universities, pursue the plan which I have outlined to you as the one which we pursue at Columbia, which does not to my mind in any way detract from the unity of the course of instruction, because, although the supervision of the student in his pre-engineering work is under a general undergraduate college organization, the program of study, the significance of it and the meaning and motivation are supplied from the engineering school.

H. J. Hughes (Harvard): I have been asked to tell you about an experiment which was made at Harvard about twenty years ago, which is perhaps a unique experiment in the matter of a strictly graduate school of engineering.

We have been through a good deal of reorganization at Harvard in the last twenty-five years. The Lawrence Scientific School, which began in 1847, was discontinued in 1906, and its work was taken over by a group of strictly postgraduate professional schools: the school of engineering which included civil, mechanical and electrical engineering; the school of mining, which included mining and metallurgy; the school of architecture, which included landscape architecture, and the Bussey Institution devoted to research in the field of plant and animal husbandry. The School of Architecture and the Bussey Institution are still vigorous as postgraduate schools; but the school of engineering and the mining school as strictly graduate departments came to an end when the Technology agreement was made in 1914.

Many interesting things happened during the eight years, from 1906 to 1914. The number of students enrolled in the fields of study formerly included in the Lawrence Scientific School dropped off from about five hundred and seventy-five to about one hundred and fifty. In those departments which are included in the present engineering school, the numbers dropped off from about three hundred and seventy-five to about sixty; and during these eight years, except for the men who were finishing up their four-year undergraduate programs, there were never more than seventy students enrolled in civil, mechanical, electrical, and sanitary engineering, and mining and metallurgy; the number of students being diminished to about one-sixth of what they had been before.

For admission to those graduate schools a degree in arts or sciences was required. The course of study in the graduate engineering and mining schools was normally three years in length and included the studies of the third and fourth year of a four-year engineering program plus a year of post-graduate engineering study. The degree awarded was "Master in Civil Engineering," and the like.

We got men from all parts of the country and from all types of colleges. There were a few engineering graduates; but most of them were graduates of colleges of arts, and their preparation was varied. Some of them had had little or no mathematics, and in a few cases it was necessary to spend four years in completing the requirements for a degree. From the standpoint of quality of work, everything was most satisfactory; it was almost an ideal body of students. The classes were small, occasionally too small; but mostly at least large enough to make meetings of classes informal round table discussions. The graduates have been unusually successful, as one might expect from men who have had so much and such good training.

The problem at Harvard was closely mixed up with the question of endowment. Engineering instruction at Harvard is supported by income from the fund bequeathed by the late Gordon McKay who, in his will, specifically stipulated that whatever instruction was supported with this money, must be

open to students coming directly from the public high schools. When these post-graduate schools were started at least three quarters of the work of all the old four-year undergraduate engineering programs was open to undergraduates in Harvard College. It was then possible for a boy to complete the requirements for a college degree and also a post-graduate engineering degree in five, or at the utmost six years. Later the faculty of the college decided that there were too many engineering studies in the college; and the number was reduced. It became difficult to get both degrees in less than seven years. No one was entirely satisfied with such small numbers. As more and more money began to be spent year by year on engineering instruction, and the numbers of students in engineering did not increase, the situation became unsatisfactory to many in authority. Finally in 1914 the Technology agreement was made; and the strictly post-graduate instruction was given up. It is not unlikely that in any case the arrangement would have had to be modified on account of the requirement of McKay's will.

Toward the end of this experiment the arrangement was changed from three academic years to two solid calendar years of about forty-eight weeks each, which was only fairly satisfactory, particularly as there was no opportunity for students to earn money toward their expenses.

I have looked back many times to that period and wondered why we did not get more students; but I realize now how few college graduates enter engineering schools after graduation from college. I realize also what an adverse differential in expense there is between going to eastern Massachusetts and studying in an institution at home where admirable instruction in engineering may be had. It is not at all surprising that the scheme did not work out well numerically in view of the small number of college graduates even now registered in the engineering colleges.

Moreover, the conception of this strictly post-graduate school was, I think, due to a misconception of the real situation in engineering education. President Eliot and some of the members of our faculty looked upon engineering educa-

tion from the same point of view that they did upon law or medicine. All the other professional schools were post-graduate schools; why should not engineering be a post-graduate school? The conditions of employment are not similar except for a small proportion of our engineering graduates. What we had in mind was the training of young men for the profession of engineering in the stricter sense, that is, of the few men who were to design or carry on research. We did not then sense the growing and varied demands of industry.

I have much sympathy with the idea of a college course before the study of engineering, partly based upon my own personal experience; but I do not think it feasible as the usual arrangement. There are a number of boys for whom one wishes that such a procedure might be available; but for most of them it is too long under present conditions.

The post-graduate schools of Harvard were, as I have said, almost an unique experiment. I believe there should have been a place in the country for one or two such schools; but personally I am glad we now offer four-year undergraduate programs as well as graduate work. We have almost as many post-graduate students now as we had in the whole of our engineering post-graduate school; and if we include the graduate instruction given by members of our faculty in other departments to students not enrolled in our school, we are giving more post-graduate instruction in engineering today than in the strictly post-graduate school of 1914.

Question: How many undergraduates have you now?

Dean Hughes: About two hundred and fifty.

S. W. Dudley (Yale): You have heard of the plans of Columbia and of Harvard from men who have participated throughout the history of those programs. I have some reluctance in attempting to give you an adequate idea of what was planned and accomplished at Yale because I came in on the program only after it was well under way and I feel that there are others who could give you a better perspective than I.

As most of you know, the Sheffield Scientific School grew up, in common with some other schools of science and engi-

neering, as a protest against the resistance of the arts departments to the introduction of science as a major course of study.

The history of the growth of the Sheffield Scientific School is too long to recount here; many of you know it well. Up to the beginning of the War that growth had been quite steady. While the program offered in the Science and Engineering courses was only of three years duration, there was concentration, particularly on fundamental principles and theory without attempting at the same time to provide drill in the technique of the professions which could be more quickly and effectively secured in practice.

Then, in common with the general feeling that changes ought to come and some new policy be introduced, there was a movement among the alumni of the institution toward the introduction of broader and more general courses into the engineering curriculum. The reorganization of the university into a college, and a school of science and engineering preceded by a freshman year common to both groups was put into effect about the year 1919.

That made the situation unique. The administration of the common freshman year was under the control of a separate faculty drawing its crops of instructors from all of the departments of the university now unified as university departments and not as separate and parallel departments in the scientific school and in the college. Emphasis was placed upon definite ideals of good teaching, thorough scholarship and broadening of viewpoint and training.

According to the new plan, the departments provide the instruction, and for the freshman year, the scientific school, and the college plan the curricula. The departments recommend faculty changes; the schools approve advancements, the university corporation acts. One important objective in the reorganization was to draw upon the different departments of the University for the best instructors, the most inspiring teachers that could be found for the freshmen.

Instead of specialization, the idea was definitely to avoid specialization, postponing that until after the first year period of training in fundamentals and orientation. The sifting

process mentioned in the report was not especially emphasized so far as I know. The emphasis was put particularly upon better teaching and personal contact and guidance on the part of the rather large staff of instructors and contact with the older, more experienced members of the faculty which had certain elements of advantages which we can all recognize.

There may be some advantages in that form of organization. I am not prepared to say. I think we have not yet made up our minds whether those advantages could as well be secured under our previous form of organization or not. It seems logical to expect better results when the administration can draw upon the different departments throughout the university for the teachers of freshman year. That is all right in theory but it does not always work out because there is the difficulty of impressing the needs of that first year training upon the members of the staff who are interested in more advanced work and research and graduate work rather than upon the teaching of boys in their most formative period. The need is for experienced and successful teachers, who, through their interest in the boys, are willing to put up with the more or less routine character of the instruction required.

I think the alumni as a rule have been very enthusiastic over this plan. They have been strongly in favor of more thorough, general and fundamental foundation training of the common freshman year. I believe that has been very largely the ambition and the hope of the university administration and particularly of those who have been in charge of the freshman year and who have taken on the burden of this experiment in education, to which they were willing to devote a great deal of their time and effort. I believe it is fair to say that the engineering group as a whole are less sure of the need for that kind of training. I think probably all of our engineering staff would agree more nearly with the recommendations of the report which you have just heard in that they see no reason why the cultural and broadening elements cannot be interwoven with the instruction in the engineering or technical subjects or carried along parallel with

them and indeed more effectively as the student matures in mind and in vision.

I think it is fair to say that the student attitude is decidedly against that sort of arrangement. For the most part the student knows what he wants before he comes to college. He feels he wants to enter into the atmosphere of the profession or course in which he thinks he is chiefly interested. In a few cases, he may be decidedly wrong. I see no reason why (and I believe this is the opinion of most of our engineering group), that opportunity to gain an acquaintance with the general field and if need be to shift his emphasis from one field to the other, make a complete change at the end of the first or possibly later years, might not be provided in any other scheme, but the fact remains that with our present organization, the student has a feeling that that first year is somewhat of a glorified high school course and he is marking time to a certain extent.

But, you ask, after all what are the results? It is a fact that many of the students in recent classes have appeared to be of better quality. In our engineering courses as a whole the last few years have shown a decided uptrend in the average scholastic ratings. This is no doubt a result of the training received in the freshman year, the quality of instruction given, the personal interest of the instructors, more severe entrance requirements, the limitation on numbers, and so on.

The total number of students entering the freshman year is limited to 850. Last year these were all admitted without conditions. Of these about two hundred and thirty entered the Sheffield Scientific School and they will go into the scientific and engineering courses. Those numbers have remained substantially stationary during the last four or five years.

The emphasis upon good teaching, personal contact with the student, and the meeting of students and instructor on a common ground in small sections have distinct advantages which I think we all recognize. There is always the tendency to allow the teaching of the freshman year to drift into the hands of the younger instructors or of those more interested in the routine of formal instruction. I think there is ample

evidence both in the report and in the experience of many of you that this is not necessarily so and that the advantages of concentrating some of the very best teaching available in the institution in the first year can be obtained by a variety of means.

There is a very definite and I think general feeling in our engineering group, therefore, that the present plan is still on trial. It is in its experimental stage and that due to various causes we have not yet reached a point where we can say definitely how successful this experiment is or how much promise it holds for the future, but that we are watching the outcome critically and are concentrating our attention upon the results.

T. M. Focke (Case School): I presume they have asked me to speak to agree with all that has been said, and I assure you that I do. In fact, the one thing that impressed me more than anything else, looking at this report last night, was this: Why did we not have it two years ago? That is a personal reference because two years ago there was a strong, concerted effort made to unite Case School of Applied Science with Western Reserve University. We believed then, as the Committee believes now, that it was very desirable for us to maintain our condition as an independent institution. As I stated a moment ago, this report would have backed us up most beautifully. Of course, the independent engineering institutions believe in a unified course. If a divided course were justified, it would mean, if we kept up our organizations at all, that we would first have to establish a junior college or, would have to accept all of our students from other institutions over which we had no control; or, thirdly, we would do what they proposed to do with us two years ago, ask some other institution to absorb us. To take students from other colleges would mean that shortly the same conditions would obtain for admission to the junior year as now obtain for admission to the freshman year.

We have been complaining that our freshmen are inadequately prepared. We would then complain that our juniors were inadequatey prepared, and the discrepancies between

the preparation would be even greater than they are in the freshman year. I have had a college graduate apply within a year for admission whom I could not admit to the freshman class. He had not had enough mathematics for admission to the freshman class. That condition is not unusual. If a definite arrangement were made with some other institution to take care of the first two years of the engineering course, we would have exactly the difficulties that we have had already.

About twenty years ago, we arranged with Western Reserve University, which as some of you know is on the same campus with Case, for a five-year combined course. It started off very well. I believe the first class came to us about fourteen or fifteen men strong. It kept up for several years at that rate and then began to drop off. Nominally, that course is still in effect but actually it is dead. We had one student last year; we expect one the year after next. That has worked exactly as Mr. Wickenden said it would, at least, that is our impression.

Students who have entered Western Reserve intending to take that course, in some way or other have been diverted, that is to say, not only has the other institution eliminated our poor students but it has also diverted the good ones until none come.

As Dean Pegram says, be sure of your other college if you are going to adopt something of this nature. We thought we were, and I do not believe these conditions have been due to any official action on the part of any one at the other institution. Perhaps the mere fact that we are on the same campus with considerable athletic rivalries and so on has tended to prevent students from going from one institution to the other, but in any event, the result is the same. We have not gotten students that way recently.

I believe we are also very strongly of the opinion that even such general subjects as mathematics, physics, and chemistry, will be much better taught in classes where there are only engineers and by instructors who know they are teaching

engineers and who are sympathetic with engineering, than if they are taught in the general, collegiate classes.

On these accounts, I am sure that our faculty and our trustees will welcome this report because it confirms the action that was taken a couple of years ago in refusing to go into anything of a divided nature.

H. G. Pearson (M. I. T.): The subject on which I have been asked to speak has to do with the recommendation in the report concerning the value of the cultural studies and relates to the question whether those can be taught under better auspices when they form part of a self-contained and a unified engineering curriculum or when they are provided by the arts college of a large university.

It seems to me that the recommendation in favor of the first of these alternatives will be of value and significance if the instruction is based on a program which is not made up of scraps of cultural education or humanistic education so-called, a little of one thing, a little of another, but which is built up rather around some large idea of broad social and historical import. Let me illustrate by speaking of the possibilities in this respect which are to be found in teaching history, not as it is taught in accordance with the textbooks written at the present time and used in colleges, but when it finds its material in the creative work of the men of science, the investigators, the inventors of the last one hundred and fifty or two hundred years. The work of those men is largely responsible for the conditions under which we live our life to-day. It is a story full of human interest; it touches the life of the present time at most significant points; and it has in it the power of making a stirring appeal to students whose interest is in the field of science and engineering.

Now if the people in charge of this section of engineering education can see the opportunity for cultural study in such a field as this, a program can be laid out on this basis which will include also the necessary work that must be done in written composition, and in public speaking. Here is a plan which has in it such possibilities of development, such possibilities of offering inspiring work to the staff of teachers that

it should have the support of faculties and governing boards. Here, too, is a great opportunity for this body, by expressing its approval, to do its part in making this portion of the engineering curriculum as rich and as significant as possible.

R. L. Sackett (Pennsylvania State College): There is a statement in the report that the land grant colleges have contributed by a unified program of education. It would seem to me that to a considerable number here no defense of the above statement was necessary in the first place, and in the second instance, a good wine needs no bush, and the land grant college following sixty years of experience (if one from within may say so) ranks high. In the beginning it was very different. At the time of the Civil War, there were the old line institutions of the arts and classic type in considerable numbers in proportion to the population, but there were only a half dozen institutions dedicated to instruction in scientific agriculture: a farmer's institute here with a few students and a farmer's institute there. There were only a half-dozen institutions designed to serve other members of the middle class. So when the Morrell Act was passed by Congress, after a long discussion, it developed a new type of institution, an institution that was outside the pale academically for some considerable time and the very fact that it was established out of hand by an act of Congress rather than by the process of subdivision, or by the process of addition to another institution, has unquestionably been a factor in its development. This is not a story, you see, of reorganization at all. There is nothing spectacular about the rise of the land grant colleges; it is rather a continued development.

There are several factors which I think have been involved: First, this fact, that they were developed quite independently and occupying a space that had not been occupied. They were therefore compelled to build up their curriculum independently. Second, they reported to a new type of organization, a political one—to state officials. They were surrounded by rather a serious political difficulty which tended to make them steer a cautious course. Third, since they were somewhat without the pale, the land grant colleges as they

developed were thrown into close association and there has been throughout their existence, I think, a very intimate relation among them leading to something again of unity and of support to that which the majority seemed to consider to be sound.

Fourth, the students have been drawn to a considerable extent through the history of the movement, from the middle classes, from those who were conservative and from those who had only modest means. Therefore, again, a certain degree of conservatism and freedom from experimentation has resulted because of the frugal character of the people who have contributed. It seems to me that these influences have characterized the growth of the land grant colleges and they have come to be what they are. Morrell specified there should be a practical and a cultural education designed for the benefit of the industrial classes. Those of you who are in position to judge know whether the land grant colleges have measured up.

We appreciate this statement by the Board of Investigation and Coordination. We hope it is true and believe it is true that they have contributed and we hope they will continue to contribute to education in this country. Certainly this report is so sound and so substantial and prophetic that the long, hard work of the Board, the investigators and the associates, has been justified in this single document.

A. M. Greene (Princeton): I wish to express my great appreciation of the reports made this morning and this afternoon. I think the historical background which the director gave in addition to this report will give us documentary evidence to present to those who do not always approve of just what we are trying to do. It is my particular purpose in rising to express my appreciation of all of these reports.

I do, however, wish to correct one error, and tell you something about the work at Princeton University. On page 13 it is stated that Princeton has discarded its five-year courses. The course in civil engineering was inaugurated at Princeton University in 1876, a four-year course leading to the degree of civil engineer. In 1888, Cyrus Fogg Brackett, of whom

many of the older men here know, inaugurated a graduate course in electrical engineering, requiring for admission a B.S. or a B.A. degree. In 1921, it was determined to enlarge the scope of engineering at Princeton and offer undergraduate courses of four years in the various departments of engineering—civil, electrical, mechanical, chemical and pre-mining. It was the desire to give more academic subjects than had been included in many other curricula throughout the country and therefore the old course in civil engineering was modified, a number of the advanced engineering courses were removed, and in place of these humanistic subjects were added, in a great many cases as electives.

Then to care for the student who wanted more engineering, the subjects omitted were collected together, plus some other subjects and a fifth year offered for those who wished to stay another year. At the end of that fifth year, the technical degree is given in four of the five departments. In doing this, however, we still retain the old two-year graduate course for those who wish to come. Not only have we done this for the electrical department but in the four graduate courses—electrical, civil, mechanical and chemical—we offer these two graduate years.

The previous report of the Committee speaks about the boy who leaves the engineering school in one of the lower years and is lost to the profession. We have cared for that at Princeton by permitting the engineering student to enter the science department and proceed with his work. If he finds in the first or second year that he is not cut out for an engineer or the work is a little more strenuous than he cares to carry, he just moves over. We are glad if they find they are not fitted for engineering that they can go on and complete their college course and are not always explaining to their friends why they did not graduate.

We are trying at Princeton to follow out the teachings of the report here and also the report made by the Midwestern institutions of a four-year course leading to the bachelor's degree, a fifth year for the technical degree, a chance for

transfer from the engineering school to the other department of the university.

Princeton is unique in that it has one faculty only. We have a group of engineering teachers but we are goverened by the faculty of Princeton University. However, we do through the dean of the School of Engineering, who is merely a title-holder, establish a certain engineering feeling among those boys and from the very first year they have a certain amount of engineering teaching and inspiration. We know that those who are cut out for engineers do stay with us. We do not have at Princeton the custom of trying to lead away men from engineering into the science departments. I say science because the engineering student enters with the same requirements as those for the B.S. student. That is the only department open to him generally. In our scheme we do not abolish the old, extended course, but we carry it on for those who desire it into five years.

Louis Mitchell (Syracuse): The College of Applied Science at Syracuse University now offers both four- and five-year courses in Engineering. The five-year course was started in September 1926.

Entrance to the University is through the Office of the Director of Admissions and although a minimun of 15 units is required for entrance, there is a variation in the list of required subjects for each College. Thus high school credit in Intermediate Algebra, Solid Geometry and Foreign Language is required of students planning to take Engineering but is not required of students entering the Liberal Arts College.

Each year a number of students applied for admission to Engineering but lacking the necessary required subjects were denied admission. They were however, allowed to enter Liberal Arts with the expectation that they would transfer to Applied Science after the first year.

The five-year course in Engineering came into existence as a matter of self-protection.

We found that the students admitted to the Arts College for the first year very seldom came back to the Engineering

College. The reasons for this are the same as have been previously indicated at this meeting today. The five-year program was designed to accommodate students who have not had advanced mathematical preparation in high school, or who wished to take a more extended course of study than that provided in the four-year program. Our total freshman class in engineering is about 100. Twelve entered last fall on the five-year basis. The general plan is to distribute the work of the ordinary freshman year over two years, with the addition of some electives and the required subject of "Introduction to Responsible Citizenship." During the first two years the students are allowed to take elementary mathematics, and foreign language if they did not have those units for admission. In case they have such entrance credits they are allowed to elect other subjects with the approval of the faculty. The semester schedule is from 16 to 17 hours.

The other difference in the four- and five-year course comes in the matter of tuition. The tuition in the Engineering College is fifty dollars more than in the Arts College. For the first two years of the five-year program, the students pay the same tuition as they pay in the Arts College. Of course this scheme has not been in existence long enough to prove any special merits but we believe it will be an interesting experiment. It does offer this incidental advantage. The students often come to the university undecided whether to enter Engineering or the Arts College. They can enter the Engineering College and then be transferred to the Arts College without the loss of time. The reverse process is a little more difficult.

Dean Pegram: Mr. Chairman, may I ask Dean Mitchell if he would tell us about this point: Does a student spend five years there before he gets any degree in this course?

Dean Mitchell: The first year is essentially a pre-engineering course. He becomes a sophomore at the beginning of his third year and on completion of the course gets the same degree as the students in the four-year plan.

Dean Pegram: Although he enters with fifteen points which would fully satisfy the requirements for admission to

the college? I think that might work against the engineering school if the student who comes in with full requirements has to wait five years.

Dean Mitchell: Of course, they recognize the superior advantages of the Engineering degree.

C. L. Walker (Cornell): In accepting Director Wickenden's invitation to say a few words concerning the experience Cornell has had in dealing with students who have devoted five years in acquiring the degree of engineering, may I voice Dean Kimball's keen regret at not being able to be here at this time.

Our experience with the five- or six-year courses dates back some fifteen years. At that time there existed at the university two colleges of engineering—the college of civil engineering and the Sibley college of mechanical engineering. At that time also we were not as rigidly enforcing our entrance requirements as at present. It was hoped that the opportunity of pursuing study for five or six years would lead to the election, by the student, of additional courses in the college of arts and sciences, but what really happened in most cases was that the students who were with us for five years were those who were deficient in the regular entrance requirements of the engineering colleges, and who were permitted to register with these deficiencies and to devote additional time in the university receiving the same degree at the end of five years which was awarded to those who pursued the work for four years.

Prior to the time of the combination of the two colleges of engineering six years ago, most of the five- or six-year students at Cornell were those who had been allowed to enter with less than the required entrance. Since that time (and through the reorganization) the freshman class has been governed by a committee known as the Freshman Administrative Committee. The faculty of the College of Engineering decided to make it easy for that Committee to pass upon the admission of students by prescribing definite rules. The rules prescribed are of such a nature that the entrance requirements are now being lived up to very rigorously. There

is very little latitude allowed and we have very few students who do not satisfy entrance requirements completely. Those who are deficient in certain of the entrance subjects always have more than the fifteen required entrance units.

With entrance requirements in the engineering college satisfying the entrance to the college of arts and sciences, except for one or possibly two years of language, many prospective engineering students are able to register in the college of arts and sciences. Such of these students who desire to spend more than four years in undergraduate work are encouraged to spend the first period of their undergraduate work in the college of arts and sciences, registered as students in that college, receiving at the end of four years the degree of A.B., and at the end of five years and a summer session the degree of C.E., or at the end of six years the degree of M.E. or E.E. These students constitute a second group who spend more than four years in obtaining the engineering degree.

There are a few students, a third group, who actually plan to spend more than four years in obtaining but one degree, the engineering degree, but they are mainly students who wish to go a little more slowly than the average student because, in most cases, they are working students and wish to devote some time to self-support.

At the last commencement exercises, we had slightly more than two hundred members in our graduating class, and while I do not know the exact number, I feel quite confident in saying that there were not five out of that two hundred who had spent five years in obtaining a degree in engineering unless it was because of sickness, or scholastic difficulty, or for some such reason.

There are very, very few students who come to us with full entrance requirements in the engineering college who are inclined to spend an additional year in study. I think that there are two reasons, perhaps, why we have so few who are inclined to spend five years in obtaining the engineering degree. The student has the feeling that for the five years of time which he spends in the University, he receives no

greater public recognition than the man who spends four years, and he is not altogether satisfied with the personal development which has been accomplished in that additional year as a complete recognition of the additional time spent.

It has been implied a number of times this afternoon that another reason why some of our engineering students are not anxious to devote five years instead of four years in undergraduate work is that they are really at a loss to know what courses they would like to pursue in the college of arts and sciences, and with some of the departments there has not always been as whole-hearted and sympathetic a relationship existing between the engineering and arts and sciences groups as would tend to encourage engineering students to elect studies in those departments of the colleges of arts and sciences. Much depends upon the attitude of the instructing staff in those departments in the colleges of arts and sciences to which the engineers are likely to go. We have had some men who have been very, very successful in attracting engineering students. A few years ago, I remember, we had an instructor in Economics who, in dealing with the civil engineering students, made such a strong impression upon those men that they were electing two and sometimes three additional courses in the department of economics because they felt they were getting a great deal out of the work. But with the departure of that instructor, there was a decided slump in interest, and at times it was difficult for us to have the men take any additional course beyond that required.

L. H. Rittenhouse (Haverford): So much time has been given, at least up to the present, to the larger institutions, I should like to speak for Haverford, which some of you, I know, recognize as an old arts college with engineering electives.

I though it would be appropriate to speak from the small college point of view, at least of this particular college, for I have not been delegated to represent all of the smaller institutions. When I refer to small, I mean small both in number of students, and in variety of technical courses offered.

There are about 275 students at this institution, 60 of

whom are interested to a greater or less extent in engineering. We have been in contact with many of the larger universities, in fact several of the institutions represented on the program to-day have sent officers to Haverford with the perfectly legitimate purpose of encouraging our engineering students to continue their technical studies after graduation from Haverford, at their respective institutions. A few of our students have done so. It seems to be the lament of those endorsing the six-year or divided course, that they do not get more. As regards the particular institution I speak for, possibly only one-sixth of the engineering students continue their formal education elsewhere. The large majority have discovered that a four-years' course is sufficient unless one is going into technical design or research work.

In this respect our experience, and in fact, our curriculum at Haverford is quite similar to that just called to our attention by Dean Greene of Princeton. The virtue of our general arts course with its proper proportion of science lies in its elasticity. The four-years' is a unified course for most students and part of a divided course for those few who choose to select additional years at a more technical school.

The Board classifies the engineering schools into four principal groups of 30 to 40 each, according to their type of organization or tradition. The idea is conveyed that these groups have very different curricula although that may not be the intent. In so far as my study of catalogues is concerned, I find that the curricula of all of these one hundred and fifty institutions is more or less the same on paper. They all have broad or general studies ("humanistic," in one of the Board's reports) and of course, all have fundamental sciences and professional or technical studies. Personally, I should prefer a classification based upon the amount of time devoted to general studies. At Haverford, we devote approximately the same time to fundamental sciences as do the larger engineering schools, but the proportion of time to general and professional (technical) courses, respectively, is reversed. We emphasize humanistic and they emphasize technical courses.

This leads me to mention one fact I want to bring out in

connection with the report of the Board. It is a mild criticism; more in the way of a stay of execution, because they have done so splendidly and we wish to give them time to do still better.

The criticism I have in mind is that they go a little further next time and mention specifically just what subjects they have in mind by humanistic work. I believe this is a most important factor in all education.

A brief description of humanistic work at Haverford may be of interest, not that we have the solution, but I wish to be specific. There are certain required studies of every student at this college, whether he is an arts or a science man. A minimum of one course each in psychology, philosophy and the Bible is required. These are in addition to the more commonly required economics, English and foreign languages. We believe (it is Haverford's tradition) that such requirements tend to give a broad and liberal training. Most of our students, as has been said, enter directly into industry and public utility corporations and their progress is entirely satisfactory. The policy outlined above contributes to their success in our opinion, as much as any other single factor. This may explain why so few of our graduates find it desirable to continue their formal training elsewhere.

President Sharpless, who successfully guided the destiny of this college for many years and who has now passed on, used to tell a story which I feel will explain the attitude of some of the smaller arts colleges.

A query was presented by a certain old Quaker lady at one of their meetings. She asked three questions: First, why young boys pull green apples from the trees when, if they would only wait, the apples would come to them; second, why men go to war and shoot and kill one another when, if they would only wait, they would die anyway; third, why boys go around chasing after girls, when if they would only wait, the girls would come to them anyhow.

I congratulate the Board on this most excellent report and I am waiting for the time when they will go all the way and come to a curriculum a little more like that of Haverford.

INCREASING THE MEMBERSHIP OF THE SOCIETY.

In the December number of THE JOURNAL OF ENGINEERING EDUCATION, we will publish the membership of the Society in the different institutions. On page 273, October, 1926, JOURNAL, you will find the number of your faculty members who were members of the Society on that date. If you do not have this number at hand, we will gladly furnish you with the figure.

There is an application blank on the next page which you should have filled out by that colleague of yours who is interested in engineering education but who is not a member of the Society. Additional application blanks will be mailed upon request.

After endorsing this application blank, have your colleague fill it out, and mail it *at once* to the Secretary, Dr. F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa. All applications received on or before December 1, 1927, will be included in the figures published. Will your institution show an increase?

Return to the Secretary, F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.

Date.....

THE UNDERSIGNED desiring to become a member of

THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION

hereby agrees to conform to the requirements of membership, if elected, and submits the following:

STATEMENT OF QUALIFICATIONS.

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NEW MEMBERS.

BOSE, SURENDRA NATH., Assistant Chief Electrical Engineer, The Tat. Iron & Steel Co., Ltd., Jamshedpur, via Tatanagar, B. N. Rly. India. H. Diederichs, D. S. Kimball.

CAVERLEY, LOYST C., Instructor in Electrical Engineering, University of Minnesota, Minneapolis, Minn. O. M. Leland, W. E. Brooke.

DEJUHASZ, KALMAN J., Instructor in Mechanical Engineering, University of Minnesota, Minneapolis, Minn. Fred. Bass, O. M. Leland.

DENEEN, DAVID J., Instructor in Architecture, University of Minnesota, Minneapolis, Minn. O. M. Leland, W. E. Brooke.

DISQUE, ROBERT C., Academic Dean, Drexel Institute, Philadelphia, Pa. F. E. Turneaure, C. E. Magnusson.

DOLAND, JAMES J., Assistant Professor of Sanitary Engineering, University of Illinois, Urbana, Ill. J. E. Babbitt, W. C. Huntington.

FENWYCK, HAROLD H., Assistant Professor of Engineering Drawing, University of Louisville, Louisville, Ky. B. M. Brigman, W. B. Wendt.

FIFE, SAMUEL T., Assistant Professor of Electrical Engineering, University of Louisville, Louisville, Ky. D. C. Jackson, B. M. Brigman.

GIRVIN, HARVEY F., Assistant Professor of Applied Mechanics, Purdue University, LaFayette, Ind. W. M. Sanders, A. P. Poorman.

HAWKES, JOHN B., Member, Editorial Department, Ginn & Company, 98 Pinckney Street, Boston, Mass. A. A. Potter, R. A. Seaton.

HOLBROOK, ELMER A., Dean, Schools of Engineering and Mines, University of Pittsburgh, Pittsburgh, Pa. F. L. Bishop, R. L. Sackett.

HOLCOMB, GLENN W., Assistant Professor of Civil Engineering, Oregon Agricultural College, Corvallis, Ore. H. S. Rogers, L. F. Wooster.

HUGHES, CHESTER A., Assistant Professor of Structural Engineering, University of Minnesota, Minneapolis, Minn. O. M. Leland, W. E. Brooke.

HUGHES, THOMAS P., Instructor in Forging, University of Minnesota, Minneapolis, Minn. O. M. Leland, W. E. Brooke.

HUNT, ORVILLE D., Assistant Professor of Electrical Engineering, Kansas State Agricultural College, Manhattan, Kans. R. G. Kloeffler, R. M. Kershner.

JOHNSON, CHARLES A., Director of Engineering and Trades, North Texas Agricultural College, Arlington, Tex. H. D. McMurtray, F. C. Bolton.

MCFARLAND, DAVID F., Acting Dean, School of Mines, The Pennsylvania State College, State College, Pa. R. L. Sackett, A. J. Wood.

McKay, Earle D., Instructor in Mechanical Engineering, University of Minnesota, Minneapolis, Minn. Fred. Bass, O. M. Leland.

Maney, George A., Professor of Structural Engineering, Northwestern University, Evanston, Ill. O. M. Leland, Fred. Bass.

Merryfield, Fred., Instructor, Oregon Agricultural College, Corvallis, Ore. H. S. Rogers, R. H. Dearborn.

Neal, Y. A., Educational Director, Toledo Y. M. C. A. Schools, 4146 Lyman Road, Toledo, Ohio. F. R. Stewart, H. P. Hammond.

Pennington, John V., Instructor, Rice Institute, Houston, Texas. H. K. Humphrey, J. M. Pound.

Schell, Frederic B., Jr., Instructor in Mechanical Engineering, University of Pennsylvania, Philadelphia, Pa. G. E. Crofoot, W. S. Franklin.

Sloane, Alvin, Instructor in Engineering Drawing, University of Maine, Orono, Maine. B. C. Kent, E. J. Felker.

Snyder, M. K., Professor, Washington State College, Pullman, Wash. F. L. Bishop, Nell McKenry.

Vance, Bruce B., Instructor in Mathematics, University of Louisville, Louisville, Ky. B. M. Brigman, W. B. Wendt.

Wheatley, Edward A., Registrar and Secretary-Treasurer, The Association of Professional Engineers of the Province of British Columbia, 5367 Elm Street, Vancouver, B. C. W. E. Duckering, E. G. Matheson.

Total new members since annual meeting, 70.

COLLEGE NOTES.*

Municipal University of Akron.—Previous to this year the cooperative course has operated on the short period; namely, three weeks. We chose three weeks because our semester is eighteen weeks in length and three weeks provided three periods in school during one semester. We have combined these three periods into one and now our students are spending nine weeks in school and the following nine weeks at work. Three three-weeks' periods make one semester of half-time work. We anticipate the following advantages:

1. A longer work period will furnish more opportunities for employment at work, which requires the worker to assume individual responsibility.

2. It will make it possible to place students in cities other than Akron, such as Cleveland, Detroit, Pittsburgh, etc., and this will be done when such students cannot get in Akron the experience that they ought to have.

3. Continued attendance at college will avoid the lost motion which comes from alternating between employment and the class room.

4. Nine weeks' continuous work will enable us to require home study courses amounting to two credit hours per week.

When the students were notified of this plan last year and asked to express their opinion upon it a few were opposed to the change but the large majority expressed themselves as being favorable to it. At present we have no basis for comparison, but we are watching it very closely.

The College of Engineering, University of Arkansas, is now housed in its new building, which is three-story, with a frontage of 214 feet. In the plan, the building has a central section 130 x 52 feet with two wings, each 84 x 42 feet, forming a "U"-shaped plan. It is practically of fireproof construction, reinforced concrete column and beam frame with cut limestone on the outside. All partitions are hollow tile and

* Additional College Notes will appear in the December JOURNAL.

none carrying load, steel window frames and sash used throughout.

There are 43,668 feet of floor space. The first, or basement story, is 15′ 6″ high, second story 12′ 4″, third story 11′ 14″. The basement story is given up entirely to laboratories for Civil, Electrical and Mechanical Engineering and the Engineering Experiment Station. The second floor contains the main offices, an auditorium which will seat 250 people, a library with book stacks for 13,500 volumes, and seven class rooms which will seat 215 students at one time. The third floor contains the drafting rooms for Civil, Electrical and Mechanical Engineering and Architecture and Drawing, a blueprint and photographic room, communication laboratory, five offices, four class rooms which will seat 220 students at one time and an art studio.

The building was completed last August and the Engineering College moved in the latter part of August and first part of September this year.

Carnegie Institute of Technology.—Five new faculty appointments to the College of Engineering are announced for this year. They include John H. Neelley, as associate professor of mathematics; Howard V. Russell, as assistant professor of physics; Walter H. J. Taylor, as assistant professor of chemical engineering; Charles E. Leberknight, as instructor of physics; and John A. Davis, as instructor of civil engineering.

Dr. Thomas R. Alexander, assistant professor of chemistry, has been elevated to the rank of associate professor of chemical engineering. In addition, Frank C. Ashe, head instructor of the department of electrical equipment and construction of the College of Industries, has been transferred to the College of Engineering with the rank of assistant professor of electrical engineering.

Case School of Applied Science opens the college year with a large enrolment of freshmen—the largest class to enter since the war days of the R. O. T. C. when an unusual number enrolled. The large class of '31 may indicate an ever

growing favor for the engineering education and may reflect the position of Case School in a large industrial center.

Professor P. J. Zimmers, formerly Extension Director for the University of Wisconsin, is a new member of the Case faculty. He will coordinate the courses of engineering training with the preparation and desire of high school men. Meeting a large number of the superintendents and principals he will acquaint them with fields of engineering and courses which will fit the high school boy for that particular aptitude which is recognized in the high school years.

Professor Frank Tracy Carlton comes from Depauw University to the chair of economics of Case School. Courses will be offered in general economics and in more specialized studies of Labor Relations.

The Case equipment has been materially enlarged by the completion of the splendid William Bingham Mechanical Engineering Building. This new laboratory has been fully equipped during the summer and is now ready for all the work in that field. A new laboratory for Mechanics and Hydraulics is under construction and will be ready by the first of February. This building is of red brick and Indiana limestone and will be three stories high, fully equipped with the best testing machinery and all electrically operated.

Duke University.—W. H. Hall, Professor in charge of Engineering has returned to his duties after spending his year of leave at the University of Wisconsin.

Harold C. Bird, who has been acting as Professor of Civil Engineering during Professor Hall's absence continues as Professor of Civil Engineering.

W. J. Seeley has been promoted to Associate Professor of Electrical Engineering.

S. R. Schealer, formerly Associate Professor of Electrical Engineering at Lehigh has been appointed Assistant Professor of Electrical Engineering.

State University of Iowa.—In order to indicate more definitely its purview, the College of Applied Science has been renamed College of Engineering. The change is in name only

inasmuch as the curricula and researches of this college have always been confined to engineering and the nature of its activities is not affected.

The appellation of applied science has remained from the early beginnings when many sciences were purely investigative having little, if any, practical application to every day affairs, and engineering was essentially the only applied science. Nowadays, nearly all sciences have an applied aspect as well as investigative, hence to restrict the term applied science to engineering had become confusing.

The chemistry of manufactures, the geology of petroleum production, the botany that combats destructive rusts and fungi, the entomology that will destroy the corn borer, and the psychology that will select capable employees are unmistakably applied sciences, but many of these have developed into separate professions or have become attached to colleges of agriculture, medicine or commerce. At the University they have never been included in the college of applied science.

Engineering is the science of utilizing the forces and materials of nature for the welfare of man and ranges in its scope from the scientific or professional phases dealing with design and administration on the one hand to the skilled crafts and mechanic arts on the other. The College of Applied Science has long been prominent among the colleges of the country in emphasizing the scientific or professional aspect of engineering as distinguished from the mechanic arts or vocational phase and there will be no modification of this policy under the new name.

The University is just now completing the first unit, and beginning the second unit, of a modern power and heating plant. In the design of this plant the possibility of its use for instruction and investigation was kept constantly in mind. Both as a plant for heating the buildings through distributing tunnels and as a power plant, the design represents good practice. It was designed by Professor B. P. Fleming, head of the department of mechanical engineering.

The new hydraulics laboratory of the University of Iowa is

under construction, the steel work just now being erected for the super-structure. After the completion of this laboratory at the west end of the University power dam across the Iowa River, all of the hydraulic laboratory work will be centered in this building. This will free the present mechanics and hydraulics laboratory building for further extension of laboratory work in mechanics of materials and allied matters.

The faculty changes consist of the appointment of Mr. Fred B. Smith, as instructor in mechanics to succeed Mr. I. H. Prageman who resigned to accept a position at the University of Maine, and the appointment of Mr. Jay N. Edmondson to succeed Mr. H. C. Thompson as instructor in engineering drawing and descriptive geometry.

F. A. Nagler was promoted from associate professor of mechanics and hydraulics to be professor of hydraulic engineering.

Lafayette College.—Dr. William M. Lewis became President of Lafayette College at the opening of the fall semester. Dr. Lewis for several years has been President of George Washington University, Washington, D. C.

New appointments to the engineering faculty include: Mr. Ernest M. Fernald of Cornell as Assistant Professor of Mechanical Engineering and Mr. Carleton Kidney as Instructor in Civil Engineering.

Professor Morland King, head of the Electrical Engineering Department, has returned from his Sabbatical leave. Professor King studied transient electrical phenomena at the University of London.

Professor Eugene C. Bingham, head of the Department of Chemistry and Chemical Engineering, is on leave of absence for the first semester and is spending the interval in study in Europe.

Professor Donald B. Prentice has been elected chairman of the Lehigh Valley Section of the American Society of Mechanical Engineers.

Lehigh University.—The Board of Trustees has given general approval to the floor plans and elevations for the pro-

posed James Ward Packard Laboratory of Electrical and Mechanical Engineering, work upon which may soon be started. The money available for this new building is $1,000,000.

Associate Professor Alpha A. Diefenderfer, of the Department of Chemistry, is on leave of absence for one year beginning September 1, 1927. Assistant Professor Lester L. Leach, of the Department of Mechanical Engineering, is on leave for one year beginning September 1, 1927.

Promotions.—NELSON S. HIBSHMAN, Instructor to Assistant Professor of Electrical Engineering; ARCHIE R. MILLER, Instructor to Assistant Professor of Electrical Engineering; JOSEPH B. REYNOLDS, Associate Professor of Mathematics and Astronomy to Professor of Mathematics and Theoretical Mechanics.

Assistant Professor Eric Sinkinson is transferred from the Department of Chemistry to the Department of Mining Engineering as Assistant Professor of Ore Dressing and Fuel Technology.

New Appointments.—CHARLES CLARENCE BIDWELL, Professor and Head of the Department of Physics; TOMLINSON FORT, Professor and Head of the Department of Mathematics and Astronomy; EUGENE STANLEY AULT, Assistant Professor of Machine Design; PRESTON B. CARWILE, Assistant Professor of Physics; ROBERT LEWIS HANSON, Assistant Professor of Physics; HARVEY ALEXANDER NEVILLE, Assistant Professor of Chemistry; MAX PETERSEN, Assistant Professor of Physics; EDWIN RAYMOND THEIS, Assistant Professor of Chemical Engineering; JOSEPH MAX ANDRESS, Instructor in Electrical Engineering; WILLIAMS BASSETT GETCHELL, Jr., Instructor in Civil Engineering; ELLIOTT LEE MCMILLEN, Instructor in Chemical Engineering; CARLETON FRANCIS MAYLOTT, Instructor in Electrical Engineering; ROBERT BEVERLY MORRIS, Instructor in Civil Engineering.

University of Maine.—Walter J. Creamer, Jr., Associate Professor of Electrical Communication, has recently published a bulletin on Vacuum Tube Amplifiers for Audio-Fre-

quency Currents. Copies of this may be secured at a small cost upon application to the University Library. Professor Creamer is also preparing a bulletin for distribution to high school students giving information on engineering as a career. He is also undertaking some research work on devices for obtaining power from lighting circuits to take the place of A and B batteries in radio sets.

The Crosby Laboratory of Mechanical Engineering has been partially completed and the two side wings are being used for a Materials Testing Laboratory and for work with gas engines. In this connection an electro-dynamometer of 75 H.P. was recently purchased from the General Electric Company. Next year money becomes available for the completion of the Hydraulic Laboratory in this building.

The College of Technology Experiment Station has been reorganized so as to include the work of all departments in the College. Formerly the work of this station was confined exclusively to cement testing and cement investigations and highway work.

Additions to the faculty of the College of Technology are: Irving H. Prageman, Assistant Professor of Mechanical Engineering; Alvin Sloane, Instructor in Engineering Drawing; George E. Spencer, Instructor in Civil Engineering; Harold B. Friedman, William L. Gilliland and Joseph F. Kolouch, Instructors in Chemistry.

University of Michigan.—Dean Cooley, who has been anxious to retire for the past five years, was last June given a year's leave of absence with the understanding that his resignation would be accepted at the end of the present year. With characteristic energy and devotion, the Dean has preferred to spend the year in his office, relieved of much administrative detail by Acting Dean G. W. Patterson, and free to devote his time to his writing. The Colleges of Engineering and Architecture are therefore having the benefit of his judgment and counsel this year as he brings his long period of active service to a close.

The Department of Engineering Research, which began its

publication work something over a year ago, is bringing out November first as its eighth bulletin, a study of the patents governing the use of chromium plating baths. This is part of a research undertaken by Richard Schneidewind, Assistant Investigator in the Department, and financed by the Detroit Edison Company. The complete report on Mr. Schneidewind's research will appear within the next two months. The publication of this Department is under the editorship of J. Raleigh Nelson, Head of the English Department.

The appointment of Dr. S. Timoshenko as Professor of Engineering Mechanics brings to Michigan a distinguished authority in this field. Prof. Timoshenko occupied the chair of Applied Mathematics in the Polytechnical Institute of Kieff, and later, in turn, was Professor of the Theory of Elasticity in the Institute of Engineers of Ways of Communication in St. Petersburg and Professor of Applied Mathematics in the Polytechnical Institute at Zagreb, Jugoslavia. After the War he came to the United States where he was first connected with the Vibration Specialty Company of Philadelphia, and since 1923 with the Westinghouse Electric Company as research engineer. His publications are regarded as authoritative in their field. He has served as consulting engineer for the Navy Department at St. Petersburg; he has been a member of the Technical Council of the Aircraft Division of the War Department. Such a man should give a great stimulus to the development of research along the lines in which he is interested.

The Department of Aeronautics is experiencing a rapid expansion this year. The enrollment has risen from eighty to one hundred and forty. This is in addition to students enrolled in the naval aviation courses. The ground school of the naval aviation reserve unit established at Michigan last year by the Navy Department has met an enthusiastic response. One hundred and fifty students are enrolled in the two courses, the theory of flight and sea navigation offered by Prof. R. H. Curtis and Prof. E. A. Stalker. It is appreciated that this unit affords college men of all departments

an opportunity to get flying training at a small expense. Students in aeronautical engineering who are enrolled in the R. O. T. C. commonly obtain their flying training during the summer in government flying fields.

The establishment of a professorship in applied aeronautics by the Guggenheim Fund has given a new stimulus to research and advanced study in aeronautics. L. V. Kerber, Chief of the Aerodynamic Unit at McCook Field for several years, has been appointed to this position for the term of ten years covered by the grant.

The wind tunnel, which has been under construction for the past four years, is practically complete and ready to be used for tests. It is one of the largest and most completely equipped tunnels in this country. It is of the double-return type, with a floor area of 4,000 square feet. The diameter of the air current passing freely through the Eiffels chamber is variable—8, 7, 6, and 5 feet. This is a new and important feature. The air current is produced by a propeller-type fan driven by a 300 h.p. a.c. slip-ring motor. The maximum wind velocities are as follows: at 8 feet diameter, 100 miles or more per hour; at 5 feet diameter, 250 miles or more per hour. The equipment includes a 3-component aerodynamic balance of the wire type, having a capacity of 900 pounds lift and 200 pounds drag. Other apparatus is under construction.

Mississippi Agricultural and Mechanical College.—The enrolment of the school of engineering of Mississippi A. and M. College has passed 600 and is the largest in the history of the school.

The **Missouri School of Mines** has been actively interested in, and keenly alive to, all phases of the three-year period of the investigation, and the subsequent period of coordination. For the past four years there has been in the institution a Committee on Engineering Education, carrying on investigation, cooperating with the Board of Investigation, and recommending for adoption into the program of the School of Mines such changes and advances as have seemed worthy of consideration for the institution. This Committee has been

reappointed for the current school year, and consists of Professors Mann (Chairman), Dunlap, Frame, Orten, Woodman, Hanley, Forbes, Lloyd, Muilenburg, and Graham.

Last year, the Committee recommended, and the Faculty adopted, an experimental program designed to afford better opportunity for the gifted students. A sifting process to find these gifted students was first necessary so that the Iowa Placement Tests were adopted as a feature of the gifted student program. These examinations had previously been tried out at this school, and with very satisfactory results (fairly high correlation between test scores and semester grades). The Iowa tests given this year consisted of both Aptitude and Training tests in Chemistry, English, Mathematics, and Physics. Inasmuch as the Iowa series of placement tests includes no test for mechanical drawing, and as it seemed desirable to set up such tests for all Freshmen subjects given the first term, the School of Mines department of Engineering Drawing devised a placement test for Aptitude in Engineering Drawing, and gave it to all freshmen entering Drawing classes. The study of the results of these Drawing tests, their correlation with term grades, the relative difficulty and appropriateness of the various test questions used, the devising of alternate forms of the test, and the perfection of a similar test for Training in Drawing, together with similar tests for Descriptive Geometry, constitute part of the coming year's work at our institution.

The sectioning of classes in Chemistry, Drawing, English, Mathematics, and Physics for the present semester was done on the basis of results of the placement tests mentioned. Inadequacy of financial appropriations for the School this year made an ideal sectioning process impossible, for the reason that additional rooms and instructors desired could not be had. However, in the case of English classes, the ideal sectioning was found possible. Normally, the upper and lower quartiles each segregate about 25 per cent of the combined class. This leaves, normally, a 50 per cent group of the class of medium ability. The English Department considered

this group too large for efficient instruction, so that it was divided into halves, thereby creating sections no one of which would have in it more than 29 students. With these sectioning arrangements made, varied programs appropriate for the three different levels of intelligence were established in each department, so far as possible for this year. In the case of the gifted group, especial efforts are being made by the instructors to give the students in that group the best, fullest, most enriched program that is possible.

Some attention is being given to methods of testing student achievement, and to efficiency of instruction. The old final examinations, for some time discontinued, have been restored, and a weight assigned them of one third the entire grade of each individual course. In some departments, particularly in Engineering Drawing, efforts are being made to change from the old "essay" or "Subjective" type of examination to the newer, more scientific "objective" type.

The administration of the program for gifted students has, so far, been vested in a Committee on the Work of Freshman and Sophomore Students, on which committee there is at least one instructor from every department giving instruction to freshmen or sophomore students. The Committee consists of Professors Woodman (chairman), Carlton, Hinsch, Lloyd, Armsby, Mann, Kershner, and Johnson. This committee supervises administration of the Placement tests at the beginning of the term, passes on any cases of excess hours scheduled, and considers individual cases of freshmen and sophomores with respect to the gifted-student program. So far, there is no definite plan for gifted students in their third and fourth years, and such students are not under jurisdiction of this committee.

An increased incentive for high scholarship has been found to be the periodic charts or grade reports issued by the Registrar, on which the average grade of various campus groups of students are shown. Thus, scholarship of Independents and that of "Greek letter fraternities" may be compared. Scholarship of men in the five different classes (Freshmen,

Sophomore, Junior, Senior, Graduate) are shown. Scholarship records of men belonging to such groups as Tau Beta Pi, Phi Kappa Phi, and Theta Tau, may be compared with each other, or with group records of other kinds.

Much could be said of general developments and changes within the School during recent years. The last two years have witnessed the addition of the curriculum in Ceramic Engineering. Last year the Ceramics department enrolled 15 students. This year it has 28. The departments of Economics, Biology and Psychology, added at various times since 1920, have all had a healthy growth. These departments afforded a more varied and enriched program for those students who are interested in the broader aspects of engineering. Comparison of the entire series of engineering curricula offered in the School show significant developments initiated in the 1920–21 school year.

For many years this institution has offered advanced work in the several specialized fields of engineering, and in general science. The degrees offered were Master of Science (within the specialized field) for work in residence, and the several professional degrees (in absentia), conferred after at least three years active, responsible engineering practice, with the usual thesis requirement. The location at Rolla of the Mississippi Valley Experiment Station of the U. S. Bureau of Mines, together with the construction of the new and specially designed mining and metallurgical laboratory building provided by the School for use of the Bureau of Mines station, gave considerable impetus to graduate work in the fields of mining, metallurgy, chemistry, and geology, particularly to the first two. During the last year programs were made available for those desiring to work for the degree of Ph.D. in these four named fields. With the facilities provided by its well organized departments of mining and metallurgy, and through the U. S. Bureau of Mines and its laboratories, it is felt that this institution is particularly well situated and equipped to offer M.S. and Ph.D. work in mining and metallurgy.

The present semester has brought the largest registration in the history of the institution, and at a time when there has been a marked decrease in legislative appropriations. In some departments the instructional equipment and force are being taxed severely to accommodate all students. The total registration for first semester is this year 466. Last year's enrollment for the entire year was 446.

Dr. W. D. Turner, head of the Department of Chemistry and Chemical Engineering, is on sabbatical leave, doing graduate work in Chemistry at Columbia University, New York. Prof. K. K. Kershner is acting head of the Chemistry Department during Dr. Turner's absence. Prof. I. H. Lovett is on leave for the year, and is taking graduate work in electrical engineering at the University of Michigan, Ann Arbor.

Prof. H. H. Armsby, Registrar, who was last year chairman of that section of the American Association of Collegiate Registrars comprising professional and technical schools, was re-elected chairman of that division for the ensuing year.

Prof. Geo. R. Dean, head of the Mathematics Department, has recently completed the solution of the long-distance power transmission circuit, and has obtained the following results:

(*a*) Graphical calculation of load current and wattless reactor current for given load voltage and power factor.

(*b*) General formula for power input for given load voltage, load current, reactor current, and load power factor.

(*c*) General formula for efficiency for given load voltage, load current, reactor current, and power factor.

(*d*) Formula for maximum efficiency, which is shown to be the same for all power factors. Calculation of voltage and currents when efficiency is a maximum. The output at maximum efficiency is shown to be the same for all power factors.

The graphs of formulæ developed by Professor Dean are both exceedingly interesting, and valuable.

Prof. C. V. Mann, Professor of Engineering Drawing, and head of that department, has devided the first of a set of placement tests in engineering drawing and descriptive geometry,

to be used hereafter in connection with the "gifted-student" program adopted by the School.

The College of Engineering of the University of Nebraska has instituted a Freshman Engineers' Day, occurring directly after registration in September and immediately preceding the beginning of class work. This year it came on Wednesday, September 14, classes meeting on Thursday. In so brief a time as one day, only the most apparent needs may be met. The men, in groups of fifteen, were directed by faculty members, and visited all of the important parts of the two campuses. Later they lunched together. There were only five talks, each quite short, none over fifteen minutes. In these, there were presented some of the necessary elements of success in college work, standards and routines. All of the staff members of the engineering departments were introduced, and their work briefly mentioned. Our freshmen are having less trouble than usual in getting started, and seem to have been saved much time and effort.

Paul Allerton Cushman, has been appointed Associate Professor of Mechanical Engineering.

Professor Jiles W. Haney has been advanced to the Chairmanship of the Department of Mechanical Engineering, taking the place of Professor William L. DeBaufre, resigned. The latter has gone with the International Combustion Engineering Corporation, New York City, to conduct certain research work they have initiated.

Dean George R. Chatburn has given up his university post as Dean of Men and will devote all of his time to the duties of his department and his classes.

Paul F. Keim is now Instructor in Civil Engineering. He was formerly Instructor in Applied Mechanics.

After a rather extended consideration of the proposal, the College of Engineering refused to substitute a Problems Course for a part of the present Freshman Orientation course.

Princeton University.—The new Engineering Building will be ready for occupancy in September 1928.

We have recently constructed a cement and concrete labora-

tory, which is being used for part of the mechanical engineering work this year.

Raymond J. Stark has been appointed an Instructor in Civil Engineering.

During the summer Professor George E. Beggs and David B. Sloan, a recent graduate of the graduate school of engineering, have been working on a celluloid model of the Stevenson Creek dam. Important relations have been discovered by means of this model although in a large measure it checks the work done on the dam in California.

Purdue University.—The Indiana Gas Association has appropriated to the Engineering Experiment Station of Purdue University, $50,000, for teaching and research in Gas Engineering, to be expended at the rate of $10,000 per year.

The American Railway Association is continuing the cooperative relations with the Engineering Experiment Station of Purdue, and is financing two projects.

(*a*) A study of power air brakes. In connection with this project 70 technically trained engineers are employed, and the salary budget not including supplies and equipment is about $15,000 per month.

(*b*) The second project is concerned with a study of draft gears. For this purpose the American Railway Association has constructed a building at a cost of about $25,000, and has installed a testing machine which drops a weight of 27,000 lbs. The cost of this machine is about $40,000. On this project six men are employed and the operating budget is about $2,000 per month.

The Indiana Limestone Company is continuing the cooperative relations which were started four years ago, and is supporting one research professor and one research fellow in the Engineering Experiment Station. Investigations are also carried on in cooperation with the U. S. Bureau of Public Roads, and a large number of manufacturers.

The second unit of the Civil Engineering Building of Purdue University is now being constructed which will increase the facilities for Civil Engineering materially and will provide up to date laboratories for material testing.

A new laboratory is being constructed for Metallurgy.

The new members of the engineering staff include the following:

Civil Engineering: Ben Browne, Instructor; G. P. Springer, Instructor; H. E. Wise, Research Assistant.
Chemical Engineering: W. E. Robbins, Fellow, Indiana Limestone Cooperative Investigations.
Electrical Engineering: L. L. Carter, Research Assistant.
Mechanical Engineering: H. A. Jacklin, Associate Professor.
Practical Mechanics: H. L. Daasch, Instructor; G. H. Parker, Instructor.
Applied Mechanics: H. F. Girvin, Assistant Professor.

Rhode Island State College.—Three important buildings will be added to the Rhode Island campus during the coming year—an Engineering Building, a combined Library and Auditorium, and a Gymnasium.

The first of these buildings has already reached the second story and work is progressing rapidly. Ground is just being broken for the second, and preparations are being made to begin on the third.

The Engineering Building will house the departments of Mechanical, Electrical and Civil Engineering. It is expected that it will be ready for use at the opening of the next school year.

Provision has been made for adding new and adequate equipment to the various engineering laboratories.

The engineering faculty remains unchanged except for the promotion of Messrs. C. H. Wales and R. E. Brown from the rank of Instructor to that of Assistant Professor of Mechanical Engineering.

Rice Institute.—Mr. J. V. Pennington has been appointed Assistant Professor of Mechanical Engineering. Mr. W. E. White has been appointed instructor in Civil Engineering.

The Mechanical Engineering Department has received gifts of five automobiles and aeroplane engines during the past summer.

South Dakota State School of Mines.—The School of Mines was honored, shortly before school opened, by a visit from President and Mrs. Coolidge. Their chief interest was in seeing the museum with its collections of Black Hills minerals, ores, rocks and fossil remains of some of the pre-historic animals that once roamed the section of the country which is now known as the Badlands.

The school year opened with the largest enrollment in the history of the school, surpassing last year's total by more than 17 per cent. The incoming Freshman class is also of unprecedented size, it being 35 per cent larger than the Freshman class last year.

Approximately 90 per cent of the students enrolled are from South Dakota. Other states and foreign countries represented in the student body are Florida, Illinois, Iowa, Minnesota, Nebraska, North Dakota, Ohio, Wisconsin, Wyoming, Germany, Russia and Siberia.

The School of Mines has recently published its Bulletin 15. This bulletin by Dr. J. P. Connolly, professor of mineralogy and petrography is entitled "The Tertiary Mineralization of the Northern Black Hills." The material contained in the bulletin follows very closely the thesis recently presented by Professor Connolly to the geological faculty of Harvard University when he received the degree doctor of philosophy. The bulletin has a distinct economic trend and has been most favorably commented upon by those who have had opportunity to study it.

The principal project in which the Engineering College of the **University of South Dakota** is interested is an Engineering building for laboratories, lecture rooms, and drafting rooms. The building is next on the building program of the University, which has been slackened by the financial and agricultural depression. The engineering building is two years ahead of us.

The college undertook the experiment of putting a radio instructor upon our staff last year. The experiment was not a success. This year Dr. B. B. Brackett, Professor of Electrical

Engineering, is giving one course of three hours in Radio to seniors.

The College of Engineering of the University is cooperating with the Engineering Department of the State College and with the School of Mines in a state organization of the S. P. E.E. Our first meeting will be held in Sioux Falls in January, at the same time as the annual meeting of the Engineers and Architects of the state. High school men are invited to attend the meeting and take part in the discussions.

The Civil Engineering Department of the University of South Dakota, under the direction of Professor R. V. Newcomb, is carrying on some interesting highway research that has gained favorable recognition throughout the highway world. Super-elevation and widening of highway curves is the nature of Professor Newcomb's research. In view of constantly increasing highway needs, and the fact that most states are raising the legal speed limit to at least forty miles per hour, it is necessary to so design all curves that a uniform speed may be maintained on all alignment. The problem of super-elevation is to find just what tilt in the roadbed will make for the greatest safety in reference to the sharpness of the curve and the center of gravity of the moving vehicle. The research by Professor Newcomb, up to the present time, has established that a tilt in the roadbed of two inches per foot width of roadway on a curve with a 300-foot radius will allow a speed of forty miles per hour with safety on a gravel surface. The same super-elevation with a cement surface would permit a safe speed of over forty-five miles per hour.

Professor M. W. Davidson, head of the Department of Mechanical Engineering, has been carrying on a mathematical research on the "Reciprocating Balance in Engines of Six and Eight Cylinders." This work has been through the fire of criticism for a whole year, and at last Professor Davidson's conclusions have been accepted by other experts and his article has appeared in the September issue of the *Journal of the Society of Automotive Engineers.*

Stevens Institute of Technology.—The Board of Trustees have added Dr. John W. Lieb, a Stevens graduate of the

Class of '80 and now Vice-President and General Manager of the New York Edison Company, to their number and have elected Mr. Walter Kidde acting-chairman of the Board to succeed the late President Humphreys and have made Mr. Alten S. Miller, Secretary.

Dr. Charles F. Kroeh has retired as Professor Emeritus of Modern Languages after 56 years of active service and Assistant Professor Paul J. Salvatore has been made acting head of the department. Dr. Kroeh's office as Secretary of the Faculty has been filled by Dr. George M. Weimar, Assistant Professor of English and History. Prof. Adam Riesenberger, who retires October 1st, after 51 years of active service successively as instructor, professor, college registrar and treasurer is succeeded as acting registrar by Mrs. O. S. Swoboda who has been his assistant in this work for a number of years past.

Prof. Charles O. Gunther, head of the Department of Mathematics has been appointed dean of Sophomores to succeed Dr. Sevenoak. Assistant Professor Richard F. Deimel of the Department of Mechanics, has been advanced to the rank of Associate Professor and Instructor Herbert C. Roters of the Department of Electrical Engineering has been advanced to Assistant Professor. Mr. John F. Dreyer of the electrical department has resigned and Mr. G. A. Albert has been appointed instructor in his place. Mr. C. E. Gingrich has been appointed instructor in the Department of Modern Languages.

During the summer the trustees increased the tuition from $300 to $400 per year effective at once and applying to students enrolled in all classes. Where this entailed any serious hardship provision was made for assistance from the Vreeland Fund, established many years ago to aid worthy students.

Professor Frank C. Stockwell, Head of the Department of Engineering succeeds Professor Riesenberger on the Committee on Scholarship and Discipline; Professor L. E. Armstrong, Assistant Professor in Mathematics succeeds Professor Riesenberger on the Committee on Rules and Schedules; Professor Richard F. Deimel, Assistant Professor of the Department

of Mechanics succeeds Professor Riesenberger on Matriculation Committee; Professor Arthur J. Weston, Assistant Professor of English and History succeeds Dr. Frank L. Sevenoak as Chairman of the Library Committee; Associate Professor S. H. Lott and Assistant Professor H. C. Roters on the Committee on Sundent Activities; Assistant Professor G. M. Weimar and G. G. Freygang to the Committee on Academic Functions; Assistant Professor H. Fezandie to the Committee on Special Lectures and Professors Deimel and E. Fezandie to the Committee on Personality Records.

Agricultural and Mechanical College of Texas.—Dr. F. E. Giesecke has been made Director of the Texas Engineering Experiment Station and will devote his efforts toward the development of engineering research work. A number of the industries in the State are cooperating in this work and it is planned to develop it much more extensively.

Each of the past two years the Texas Cotton Seed Crushers' Association has been donating crushing equipment to the college for use by the students in Chemical Engineering. This equipment now consists of a complete cotton seed oil mill and a complete soap factory is being added also. This year the Association plans to bring to the college a sufficient technical force to operate the mill for a week as a demonstration to the students, following which certain of the students who are specializing in this type of work will have practical experience in its operation.

The new members of the teaching staff are: *Architecture:* C. A. Johnson; *Chemical Engineering:* Dr. R. B. Waite, R. A. Eads, B. M. Caldwell; *Civil Engineering:* S. A. McCosh; *Drawing:* Geo. E. Tomlinson; *Mechanical Engineering:* E. R. Spencer, D. W. Fleming.

Texas Technological College is beginning its third year with very favorable prospects for the future. The state legislature provided for an increased faculty and a number of new buildings. The engineering faculty has been increased by the following new members: O. V. Adams, Associate Professor of Civil Engineering; F. L. McRee, Instructor in Civil

Engineering; W. M. Young, Associate Professor of Electrical Engineering; R. S. Fouraker, Assistant Professor of Electrical Engineering; L. M. Sahag, Assistant Professor of Engineering Drawing; A. C. Gullikson, Instructor in Engineering Drawing; M. E. Farris, Assistant Professor of Mechanical Engineering; H. B. Garden, Associate Professor of Textile Engineering.

Work has been started on the first unit of a new two-story engineering building. This unit will be U-shaped in plan with a frontage of 280 feet and wings extending back 125 feet. The building is to be completed by July 1, 1928. Spanish architecture in keeping with the general style of the college will be used. The office of Dean Wm. J. Miller of the school of engineering will be located in this new structure which will house the departments of Architecture, Civil Engineering, Mechanical Engineering, Electrical Engineering, and Engineering Drawing. The Textile Department will occupy the entire Textile Engineering Building in which the other departments are now located.

With new buildings, new equipment and additional faculty members the school of engineering is providing for constantly increasing enrollment.

The Tulane University of Louisiana.—In the Department of Physics Mr. John L. Hundley, has been appointed Assistant Professor succeeding Mr. W. P. Angel, resigned.

Mr. J. F. Thomson, graduate of the College of Engineering and who has been taking a student's course at Schenectady and doing post graduate work in Union College, has returned as Instructor in the Department of Mathematics.

We have this session introduced into our Freshman Year a problems course, which will be taught by Dean Anderson. We have been planning for this for some time and we arrived at the definite decision to put the course in this session on account of the very interesting discussion which was held at the Annual Meeting last summer at the University of Maine.

Contrary to our expectations on account of conditions due to the distressing flood situation in this part of the country,

the attendance in the College of Engineering has increased to the extent that we now have the largest number of students on record. The attendance at this time is ten per cent larger than it was in the whole of last session.

Virginia Polytechnic Institute has opened its year with 1,204 students, which is equal to the entire enrolment for last year. Of these, 674 are registered in engineering curricula, being an increase of 27 students over the entire enrolment in engineering for the past year. At the opening of the session three days were used for the orientation of new students, and during this period the psychological test of the American Council on Education was given, also the Cross English test for use in the placement of students in the sections of freshman English. These tests were given to more than 450 entering students. At the close of last year comprehensive examinations were given to students covering the work in English, mathematics, chemistry, and physics, for the first two years of the engineering curricula. The results of the comprehensive examinations were compared with the class marks of the students during the two years in the four departments. The correlation was quite high, being greatest in mathematics and least in English. A new chemistry building is being occupied this year, and also two additional dormitory buildings.

University of Virginia.—The matriculation in the Department of Engineering for the session 1927–1928, shows an increase of 14 per cent over that of the last session.

For the first time in the history of the institution a young lady has matriculated in the Engineering Department, majoring in Chemical Engineering.

The Engineering Department has initiated a Dean's List of Distinguished Students for the first time this fall. Twenty-eight men are the recipients of this honor because of their records during the past year. Admission to this select circle requires the passing of all courses for a year to the amount of at least 18 session-hours with an average grade on all work of not less than 82 per cent. Members of this group are ab-

solved from the necessity of obtaining leaves of absence and from such penalties as may be imposed for absence alone. Failure to maintain the same standard in any one term results in removal from the Dean's List with its privileges.

Work is actively under way toward the construction of the new $1,400,000 group of medical buildings adjoining the University Hospital. This group which will house all instructional departments in the Medical School will be available for service in the fall of 1929.

Wentworth Institute, school of mechanics on Huntington avenue, directly opposite the Boston Museum of Fine Arts, founded and endowed in 1911 by Arioch Wentworth with a sum amounting now to over $5,000,000, for the purpose of furnishing education in mechanical arts—and which up to date has trained 26,954 men—is rapidly expanding in its physical aspects, a new $250,000 auditorium with a cafeteria and work shops in the basement being the latest addition to the institution. The building is in process of construction.

The new structure will relieve other buildings and make way for 100 more students. The enrolment at Wentworth has steadily increased, about 2,000 students being expected for the day and night classes. The students come from all over the world and many of them are holding executive positions in foreign lands. The Wentworth Institute's influence is world-wide and the advantages of its courses are especially valued in China, India, Corea, Africa, Japan and Russia.

West Virginia University.—The second annual observation of State Safety Day of the West Virginia Bureau of Mines was held in Morgantown, September 17th. Approximately one thousand men, comprising one hundred fifty first aid teams, competed for prizes at the University Stadium. In addition to this contest there were demonstrations of coal dust explosions and rock dusting of coal mines, as well as parades and speeches. Professor C. E. Lawall, of the Department of Mining Engineering, was chief judge. Dean C. R. Jones presented the prizes. About twenty thousand people were in attendance.

Professor E. F. Church, of the Brooklyn Polytechnic Institute and for many years head of the Department of Mechanical Engineering here, revisited the campus on October 7th, in the interest of the junior branch of the A. S. M. E.

Mr. M. F. Holmes, graduate of the Department of Electrical Engineering and who last year received his master's degree from Massachusetts Institute of Technology while connected with the General Electric Company, has been appointed instructor in the Department of Physics of this University.

The Department of Chemical Engineering has inaugurated a series of elective courses in ceramic engineering under the charge of Professor W. A. Koehler. Professor Koehler made a survey of the potteries of West Virginia during last summer in the interest of these courses.